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to know the approximate times of its superior ($p = 311°$) and inferior ($p = 131°$) conjunctions, and to construct the apparent ellipse.

1878.		G.M.T. h		1878.		G.M.T. h		1878.		G.M.T. h	
Aug.	14	21	sup.	Oct.	15	14	inf.	Dec.	16	8	sup.
	17	19	inf.		18	13	sup.		19	6	inf.
	20	18	sup.		21	11	inf.		22	5	sup.
	23	16	inf.		24	10	sup.		25	3	inf.
	26	15	sup.		27	8	inf.		28	2	sup.
	29	13	inf.		30	7	sup.		31	0	inf.
Sept.	1	12	sup.	Nov.	2	5	inf.	1879.			
	4	10	inf.		5	4	sup.	Jan.	2	23	sup.
	7	9	sup.		8	2	inf.		5	21	inf.
	10	8	inf.		11	1	sup.		8	20	sup.
	13	6	sup.		14	0	inf.		11	18	inf.
	16	5	inf.		16	22	sup.		14	17	sup.
	19	3	sup.		19	21	inf.		17	16	inf.
	22	2	inf.		22	19	sup.		20	14	sup.
	25	0	sup.		25	18	inf.		23	13	inf.
	27	23	inf.		28	16	sup.		26	11	sup.
	30	21	sup.	Dec.	1	15	inf.		29	10	inf.
Oct.	3	20	inf.		4	13	sup.	Feb.	1	8	sup.
	6	18	sup.		7	12	inf.		4	7	inf.
	9	17	inf.		10	11	sup.		7	5	sup.
	12	15	sup.		13	9	inf.		10	4	inf.

Note on the Duplicity of the Companion to Rigel.

By S. W. Burnham, Esq.

More than six years ago, when using a power of 400 on my 6-inch Clark Refractor, I noticed what appeared to be a slight but decided elongation in the companion to *Rigel*, nearly in the direction of the primary. I called the attention of observers to this (*English Mechanic*, February 9, 1872), and subsequently examined the star many times with the same instrument, but was never able to satisfy myself fully that the small star was really double, and the evidence from other quarters was either negative or unfavourable. Some years later Mr. Herbert Sadler wrote me that he had noticed the same peculiar appearance in the small star, independently, I believe, and I again, in 1876,

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examined it on several very favourable occasions, finding the same appearance as before. I could not feel quite certain that it was not due to vertical elongation, although, after the precautions observed, it seemed very improbable. The attention of several astronomers in this country and Europe having larger apertures at command was specially requested to aid in deciding the question. Nothing having been received changing or modifying my own prior observations, at the first opportunity, towards the end of 1877, the 18½-inch Clark Equatoreal of the Dearborn Observatory was brought to bear, and the small star carefully examined whenever the air was sufficiently steady. There were few nights, however, at this time perfect enough to allow of the use of very high powers at a moderate altitude. Later the conditions were better, and I give below the measures when the disk of the small star was sharply enough defined to make it worth while attempting to use the micrometer. The star was examined on a number of other nights earlier, but generally the images were too unsteady to give anything more than a suspected, or uncertain elongation. But on no occasion, at any time, was the appearance such as to discourage further attempts.

February 3. Measured P = 160°·3. There does not seem to be much doubt of the duplicity of the small star. Power 900.

„ 26. Measured as follows: P = 179°·1; D = 0″·31. B is certainly double. Splendid definition. There can be no doubt now. Power 900.

March 4. Measures good. P = 178°·9; D = 0″·40. Companion is certainly double. There can be no mistake in the slight elongation measured, but excessively difficult. Measured distance is a diameter. Power 900.

It should be stated that the distance measures given above more properly belong to the long diameter of the small star than to the central distance, as otherwise the stars would, with this power, be widely separated. The real distance cannot exceed 0″·2, and is probably materially less. The position-angle measures were made with the large star out of the field, so that its direction would not bias the setting of the wires on the close pair. Several attempts were made later, but the air was not steady enough to add anything of value to the results already obtained, and no measures could be made. It may seem strange that a star so excessively close as this should have been even suspected with an aperture of only six inches, and it is not easy of explanation. I can only state that under suitable conditions single stars of this magnitude are seen with perfectly round, sharply cut, and well-defined disks, and any eccentricity, however small, might, with careful attention, be detected. If the distance were not under 0″·3 there would not be a moment's hesitation in pronouncing such a star double. I trust astronomers having sufficiently powerful and perfect instruments will give the star

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special attention. It is a severe test, and a strictly first-class telescope, whether large or small, is necessary to deal with it.

Rigel has a minute distant attendant, discovered by Mitchel at Cincinnati in 1846, and rated by him 15 magnitude. I made two measures as follows:—

	°	″
October 24	P = 1·7	D = 44·38.
„ 31	1·3	44·27.

This star has never been measured before.

Chicago, April 12.

New Double Stars. By S. W. Burnham, Esq.

I desire to call the attention of double star observers, in advance of the publication of my observations during the past year, to a few of the recent discoveries with the 18½-inch refractor of the Dearborn Observatory, in the hope that other measures may be made during the present season. The prevailing unfavourable weather here for several months has made it impossible to repeat the measures of some of the stars as often as was desired.

		°	″
1	51 Cygni	P = 102·3	D = 3·13
2	8 Andromedæ	162·0	7·40
3	27 Piscium	264·9	1·44
4	52 Herculis	309·4	1·84
5	15 Can. Ven.	284·9	1·22
6	ι′ Libræ, BC	24·3	1·86
7	Serpentis 55	356·6	0·42
8	B.A.C. 4559	57·0	0·26
9	γ Draconis	152·3	20·61

(5) 15 *Can. Ven.* is the preceding star of the wide pair, Σ 24, App. I.

(6) As a wide pair, this is H VI. 44 = Sh. 376. Herschel's companion is double, the system somewhat resembling μ *Herculis*. There appears to be a decided change in the distance from the large star. Sh. found 111°·6 : 50″·3. From three nights' measures I get 110°·5 : 57″·46.

(7) The place of this star is R.A. 15^h 37^m; Decl. + 14° 3′.

(8) This is a large star in *Boötes* (5 magnitude, according to Argelander and Heis), the place of which is R.A. 13^h 33^m; Decl. + 11° 21′. This is perhaps the only really difficult pair in the list, with a large aperture. The distance given above is not too small.

(9) The attendant is very minute. There are two other stars of about the same magnitude, 227°·1 : 47″·73 and 13°·7 : 56″·48. These should not be confounded with brighter and more distant stars in the same quadrants.

The other pairs are all unequal, but can be observed with moderate apertures.

Chicago, May 25.